Remarks:

Reconsideration of the application is requested.

Claims 1-2, 4, 10, 12 and 14-16 remain in the application. Claims 1-2, 4, 12 and 14 have been amended. Claims 3, 11 and 13 have been cancelled.

In item 1 on page 2 of the above-mentioned Office action, claims 1-4 and 10-16 have been rejected as being anticipated by Nishioka et al. (US Pat. No. 5,811,851) under 35 U.S.C. § 102(b).

The rejection has been noted and claim 1 has been amended in an effort to even more clearly define the invention of the instant application. Support for the changes is found in Figs. 2A-2E of the drawings and corresponding descriptions in the specification as well as original claims 2-3 and 13.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, inter alia:

> a barrier layer provided over said base substrate, said barrier layer including an oxygen-containing iridium layer and an oxygen barrier layer, said oxygen barrier layer being composed of one of iridium dioxide and ruthenium dioxide;

an adhesion layer disposed between said base substrate and said at least one barrier layer, said adhesion layer containing at least one material selected from the group consisting of zirconium, hafnium, cerium, vanadium, chromium, niobium, tantalum silicide nitride and tungsten silicide; and

a metal silicon layer disposed on said base substrate directly between said adhesive layer and said opening, causing a layer stack of said metal silicon layer, said adhesive layer and said oxygen-containing barrier layer to be formed above said opening. (Emphasis added by Applicants).

In the last paragraph on page 2 of the Office action, the Examiner has referred to the layer 46 shown in Fig. 7 of Nishioka et al. as both a "barrier layer" and an "adhesive layer", so that the layer 46, on one hand, is an oxygen-containing iridium layer, and on the other hand, contains at least one material selected from the group consisting of tantalum nitride, titanium nitride, tantalum silicide nitride and tungsten silicide.

Actually, Fig. 7 of Nishioka et al. shows a semiconductor substrate 30, on which an insulating layer 32 of silicon dioxide is applied, which has an opening capped with a metal layer 34. This structure basically corresponds to the base substrate of the invention of the instant application. On this thus formed base substrate, a layer 46 of titanium nitride or tantalum nitride (see the TABLE in column 7, lines 63/64), a metal layer of ruthenium oxide or iridium oxide (see the TABLE in column 8, lines 62-64), and a noble metal layer

38 (see the TABLE in column 8, lines 17/18) and a further layer 42 of, for example, Barium strontium titanate are formed one after the other.

A layer stack formed of an adhesive layer (titanium nitride or tantalum nitride) and an oxygen barrier layer (ruthenium oxide or iridium oxide) is arranged on the metal layer 34 which can be composed of a silicide (see the TABLE in column 7).

The invention of the instant application differs from the prior art in the following aspects:

(a) The adhesive layer (20) can be formed of a number of further suitable materials, such as zirconium, hafnium, cerium, vanadium, chromium, niobium, tantalum silicide nitride and tungsten silicide.

(b) In Nishioka et al., the layer 34 is formed in an opening of an insulating layer 32. In contrast, the silicide layer (9) in the invention of the instant application is formed on the opening so that it also extends over the base substrate 5 or the insulating layer 55 (see Fig. 2A). A layer stack of the layers 9, 20 and 25 can thus be formed (see the second paragraph on page 26 of the specification) and for which only one etching step is required.

(c) The barrier layer (25, 30) includes an oxygen-containing iridium layer (25) and an oxygen barrier

layer (30) composed of iridium dioxide or ruthenium dioxide.

In summary, the invention of the instant application differs from the prior art as disclosed in Nishioka et al. in the layer sequences and in the structure. Instead of a layer sequence of substrate 30/silicide layer 34/adhesive layer 46 of titanium nitride or tantalum nitride/barrier layer 48 of ruthenium oxide or iridium oxide, as disclosed in Nishioka et al., the invention of the instant application provides a layer sequence of base substrate (5, 10)/silicide layer (9)/adhesive layer (20) of zirconium, hafnium, cerium, vanadium, chromium, niobium, tantalum silicide nitride or tungsten silicide/barrier layer (25, 30) including an oxygen-containing iridium layer (25) and an oxygen barrier layer (30) composed of iridium dioxide or ruthenium dioxide. With respect to structure, in Nishioka et al. the layer 34 is completely disposed in the opening of the insulating layer 32, whereas in the invention of the instant application the layer (9) extends over the substrate.

The invention of the instant application has the following advantages:

- A number of additional materials are provided for the adhesive layer.

- The layers 9, 20 and 25 are etched in one etching step and therefore the accuracy is improved.
- The layer (9) improves the adhesion both to the metal of the plug (10) and to the insulating layer (50, 55) of the base substrate (5).
- An especially good oxygen shielding is achieved by forming the barrier layer (25, 30) from two layers.

Clearly, Nishioka et al. do not show "a barrier layer provided over said base substrate, said barrier layer including an oxygen-containing iridium layer and an oxygen barrier layer, said oxygen barrier layer being composed of one of iridium dioxide and ruthenium dioxide; an adhesion layer disposed between said base substrate and said at least one barrier layer, said adhesion layer containing at least one material selected from the group consisting of zirconium, hafnium, cerium, vanadium, chromium, niobium, tantalum silicide nitride and tungsten silicide; and a metal silicon layer disposed on said base substrate directly between said adhesive layer and said opening, causing a layer stack of said metal silicon layer, said adhesive layer and said oxygen-containing barrier layer being formed above said opening", as recited in claim 1 of the instant application.

Claim 1 is, therefore, believed to be patentable over Nishioka et al. and since all of the dependent claims are ultimately

dependent on claim 1, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1-2, 4, 10, 12 and 14-16 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out.

Please charge any fees which might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

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Marked-Up Version of the Amended Claims:

Claim 1(twice amended). A microelectronic structure, comprising:

a base substrate at least partially composed of an insulating material and formed with at least one opening;

[at least one] a barrier layer provided over said base substrate, said [at least one] barrier layer including an oxygen-containing iridium layer and an oxygen barrier layer, said oxygen barrier layer being composed of one of iridium dioxide and ruthenium dioxide; [and]

an adhesion layer disposed between said base substrate and said at least one barrier layer, said adhesion layer containing at least one material selected from the group consisting of zirconium, hafnium, cerium, vanadium, chromium, niobium, [tantalum nitride, titanium nitride,] tantalum silicide nitride and tungsten silicide; and

a metal silicon layer disposed on said base substrate directly between said adhesive layer and said opening, causing a layer stack of said metal silicon layer, said adhesive layer and said oxygen-containing barrier layer to be formed above said opening.

Claim 2(amended). The microelectronic structure according to claim 1, wherein:

[said base substrate is at least partly composed of an insulating material and is formed with at least one opening;]

said at least one opening completely penetrates said insulating material; and

at least one conductive material fills said at least one opening[; and

said adhesion layer is disposed directly on said at least one conductive material].

Claim 4(amended). The microelectronic structure according to claim [2] 1, wherein said insulating material is composed of one of silicon nitride and silicon oxide.

Claim 12(amended). The microelectronic structure according to claim [11] 1, wherein:

[said] at least one conductive material is disposed in said at least one opening [has a region contacting said adhesion layer; and

said at least one conductive material is composed of at least one metal silicide at least in said region contacting said adhesion layer].

Claim 14(twice amended). The microelectronic structure according to claim [12] 1, wherein said at least one metal silicide contains at least one silicide selected from the group consisting of yttrium silicide, titanium silicide, zirconium silicide, hafnium silicide, vanadium silicide, niobium silicide, chromium silicide, iron silicide, cobalt silicide, palladium silicide, platinum silicide and copper silicide.